January 12, 1952

Dr. Marguerite Vogt
Kerckhoff Laboratories
California Institute of Technology
Pasadena 4, California.

Dear Dr. Vogt:

About fourteen months ago, I sent you a culture of Cavalli's Hfr strain, our no. W-1033. I have had no occasion to retest this culture for some time since, and could not be sure that it was in good condition even in October 1950. There is an experiment that I should like to try now with Hfr, but unfortunately our present culture, only recently lyophilized no longer shows any remarkable Hfr activity. If you have had any better luck than I with it, I would consider it an appreciable favor if you could send back a still active Hfr.

We have made no measurable progress to the elucidation of the mechanism of recombination in Escherichia coli during the past two or three years. Meanwhile, the only points of pertinent interest have been the isolation of other fertile strains of E. coli, and the transductional genetic mechanism of Salmonella. Although of interest in other connections, these lines of work have not cast any light on the K-12 story. In the past few weeks, however some evidence has developed for a possible "hormonal" factor in E. coli sexuality that has some promise for some progress. A few special cultures from K-12 have been found to carry a "mutation", F-, in contrast to the F+ character of K-12 itself and most of its derivatives. F+ x F+, and F+ x F- ar both fertile, but F- x F- is completely infertile. At first we thought we were dealing with a case of "self-incompatibility" alleles, but it now appear that this is true in only a special sense. If an F- is grown together with a nutritionally identical F+, and this cell mixture plated on minimal agar with another nutritionally complementary F-, the markers found among the proto trophs show that many of them have come from F- x F-. If the same cells are grown separately, and then mixed on minimal agar, only the F- x F+ components will have crossed. The most reasonable interpretation is that F+ is responsib for a substance needed for recombination, and that F+ cells make this substan available to F- cells grown with them. However, I have not yet succeeded in separating an "F+ substance" from F+ cultures, so that other explanations are possible, but I think unlikely. What you have probably surmised at this point is that I should like to test the Hfr stock as possibly producing larger amounts of the hypothetical F+ fertility factor.

Mrs, Lederberg and I had noticed some time ago that well-aerated cultures were often poorly or not fertile, and so we have routinely prepared inocula from standing cultures. This has not been completely analysed, but it appears likely that part of the aeration effect is related to the inhibition of the production of the F+ factor. Well-aerated cultures of 58-161(F+) behave as if they were F-.

We have still to do some quantitative studies on this point, but I have the impression that F+ x F- crosses may be more fertile generally than corresponding F+ x F+. The effect is not spectacular, however.

Hayes, in London, has been doing some interesting work on the activation of recombination by UV. He finds that the Haas-Wyss-Stone effect is entirely due to the 58-161 in crosses with W-1177, and that the optimal conditions are similar to those for induction of lambda. In part, I can confirm his findings, but his conclusions that lambda itself has something to do with recombination are negated by Mrs. Lederberg's success with crosses of lmbda-sensitive x sensitive.

Some time ago, you mentioned to Mr. Zinder that you were preparing a note summarizing your work. Has this been published?- I have not seen it. However, Mr. Zinder mentions that he heard several second-hand reports during his recent trip on the East Coast, from which he could learn no factual details, but could conclude that you have been achieving some success in your work. Considering the obscurity which has thus far surrounded the non-genetic aspects of E. coli recombination, this will be good news indeed.

Yours very sincerely,

Joshua Lederberg
Associate Professor of Genetics